

NOTEWORTHY PRACTICES

Roadside Tree and Utility Pole Management



U.S. Department of Transportation
Federal Highway Administration



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16. Abstract Crashes involving roadside trees and utility poles are the most prevalent among fatal, run-off-road, fixed object crashes. Nevertheless, these two obstacles remain among the least-treated on the roadside. As such, comprehensive research is both needed and frequently proposed in this area. This report is intended to provide agencies with examples of successful—immediately deployable—tree and pole practices until such time as this research can be performed. These practices range from complex, multi-million dollar contract solutions to in-house efforts that can be accomplished with minimal resources, and have been drawn from every region of the United States as well as from previous research.			
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Table of Contents

- 1. INTRODUCTION..... 7**
 - 1.1 Purpose.....7
 - 1.2 Methodology..... 8
 - 1.3 Organization..... 10
- 2. REACTIVE MANAGEMENT..... 11**
 - 2.1 Keep the Vehicle on the Roadway..... 11
 - 2.1.1 Alabama: Applying Specific Countermeasures Corresponding to Individual Crash Types..... 11
 - 2.1.2 Washington: Targeting Locations through Network Analysis..... 12
 - 2.1.3 Pennsylvania: Increasing Safety in Culturally Sensitive Areas..... 13
 - 2.1.4 Tennessee: Managing Roadsides with Environmental Constraints..... 14
 - 2.2 Allow the Vehicle to Regain the Roadway..... 14
 - 2.2.1 Nebraska: Re-establishing Clear Zones during Resurfacing, Restoration, and Rehabilitation (3R) as well as Resurfacing, Restoration, Rehabilitation and Reconstruction (4R)..... 15
 - 2.2.2 Michigan: Clearing through Informed Consent..... 15
 - 2.2.3 Mississippi and Arizona: Establishing and Maintaining Clear Zones..... 16
 - 2.3 Reduce the Severity of Crashes..... 17
 - 2.3.1 New Jersey: Using Poles That Absorb Crash Energy..... 17
 - 2.4 Roadside Tree Management Practices for Reasons Other than Safety..... 18
 - 2.4.1 Alabama: Preventing Weather-related Tree Hazards..... 18
 - 2.4.2 Maine Turnpike Authority: Increasing Natural Snow-melt..... 19
 - 2.4.3 Wyoming: Removing Dead or Diseased Trees To Mitigate Fall Hazards..... 21
- 3. PROACTIVE MANAGEMENT..... 23**
- 4. URBAN TREE AND UTILITY POLE RECOMMENDED PRACTICES..... 25**
 - 4.1 Lateral Offset..... 25
 - 4.2 Visibility..... 25
 - 4.3 Weather..... 25
 - 4.4 Maintenance..... 26
 - 4.5 Worker Safety..... 26
- 5. CONCLUSION..... 27**
- 6. RECOMMENDED READING..... 29**
 - 6.1 Trees..... 29
 - 6.2 Utility Pole..... 29

List of Figures

Figure 1. Infographic. Relationship of roadside tree and utility pole crashes to all fatal crashes.....	7
Figure 2. Photo. Utility poles and trees in close proximity to the roadway.....	8
Figure 3. Map. Distribution of states with noteworthy roadside tree and utility pole management practices.....	9
Figure 4. Photo. Sycamore Allée near Halifax, PA.	13
Figure 5. Photo. Yellow prismatic obstacle delineation around a roadside pole in Tennessee.....	14
Figure 6. Photo. Composite utility pole undergoing strength testing.....	17
Figure 7. Photo. Before and after tree clearing along the Maine Turnpike.....	19

List of Tables

Table 1. NDOR Fixed Object Clearance Widths.....	15
Table 2. Comparison of composite pole to wooden pole.....	18

1. INTRODUCTION

Roadway departures account for the majority of all fatal crashes occurring in the United States. In fact, 56 percent¹ of fatal crashes fit the roadway departure definition: a crash which occurs after a vehicle crosses an edge line or a center line, or otherwise leaves the traveled way.² Of this data set, 40 percent involved a collision with a fixed object.³

Roadside trees and utility poles comprise 63 percent of the fixed objects struck, making them the most harmful event in 14 percent of all fatal crashes.⁴

Given this overrepresentation, it is reasonable to suggest that managing roadside trees and utility poles would be common strategies to reduce fatal crashes; however most transportation agencies have indicated that they find it challenging to mitigate these obstacles.⁵ A few State departments of transportation (DOT) apply some level of roadside management in this area and their practices are examined here in greater detail.

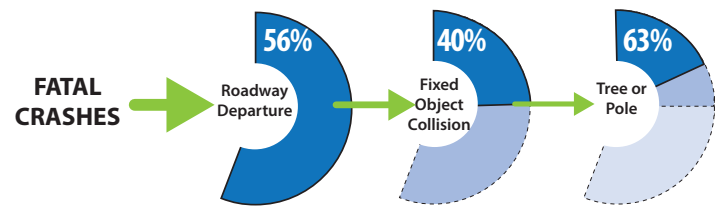


Figure 1. Infographic. Relationship of roadside tree and utility pole crashes to all fatal crashes.

1.1 Purpose

Mitigating tree and utility pole-related crashes could significantly support States' efforts to reduce fatal crashes; however, these two roadside features are arguably the most elusive of all fixed objects to control for the following reasons:

- Trees contribute to roadway aesthetics and their removal sometimes evokes deep sentimental and environmental concerns among agencies and stakeholders.⁶
- Utilities are usually privately held business enterprises that are not bound by State DOT policies. If they have rights regarding poles in public rights-of-way, they are allowed to ignore or reject requests for removal.

Coupled with reduced maintenance and operations budgets and personnel within the DOTs, these reasons lead to tree removal and utility pole relocation becoming lower roadside management priorities.

1 Federal Highway Administration, Office of Safety, "Roadway Departure Safety," 2010-2013 last modified September 1, 2015. Available at: http://safety.fhwa.dot.gov/roadway_dept/.

2 Federal Highway Administration, *FHWA Roadway Departure (RwD) Strategic Plan*, (Washington, DC: March 2013), p.3.

3 Insurance Institute for Highway Safety Highway Loss Data Institute, "Roadway and Environment: Collisions with Fixed Objects and Animals," last modified, 2016. Available at: <http://www.iihs.org/iihs/topics/t/roadway-and-environment/fatalityfacts/fixed-object-crashes>.

4 Ibid.

5 Unpublished results from a Roadway Departure Focus States Initiative survey conducted under FHWA contract DTFH61-10-D-00024, Task Order 12-003 in October 2014.

6 Neuman, T., et al, *NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, Volume 3: A Guide for Addressing Collisions with Trees in Hazardous Locations*, Washington DC: Transportation Research Board of the National Academies, 2003, pp.1-3, 1-4.



Figure 2. Photo. Utility poles and trees in close proximity to the roadway.

A comprehensive investigation of roadside tree and utility pole management has consistently rated among the highest priorities of experts in roadside safety design. Problem statements pertaining to this subject matter, however, generally receive lower funding priority when presented to the transportation community at large, resulting in a shortage of available resources on the topic. This report is intended to provide agencies with examples of successful management practices until additional research is conducted. These practices range from complex, multi-million dollar contract solutions to in-house efforts that can be accomplished with minimal resources, and have been drawn from every region of the United States as well as from previous research.

It should be noted that measures taken to reduce or eliminate tree and utility pole-related crashes will vary based on many factors, including location (e.g., urban versus rural), proximity to traffic, appropriateness of certain countermeasures, and environmental and historical factors.

1.2 Methodology

The practices described within this report are not all-inclusive; they are merely a snapshot of multiple methods gleaned from a cross-section of the industry. In a comprehensive roadway departure survey conducted by FHWA in 2014, States indicated their levels of engagement with all aspects of roadway departure, including crashes into trees, utility poles, and other fixed objects. Practices cited in this report were identified from the survey responses and through a limited literature review.

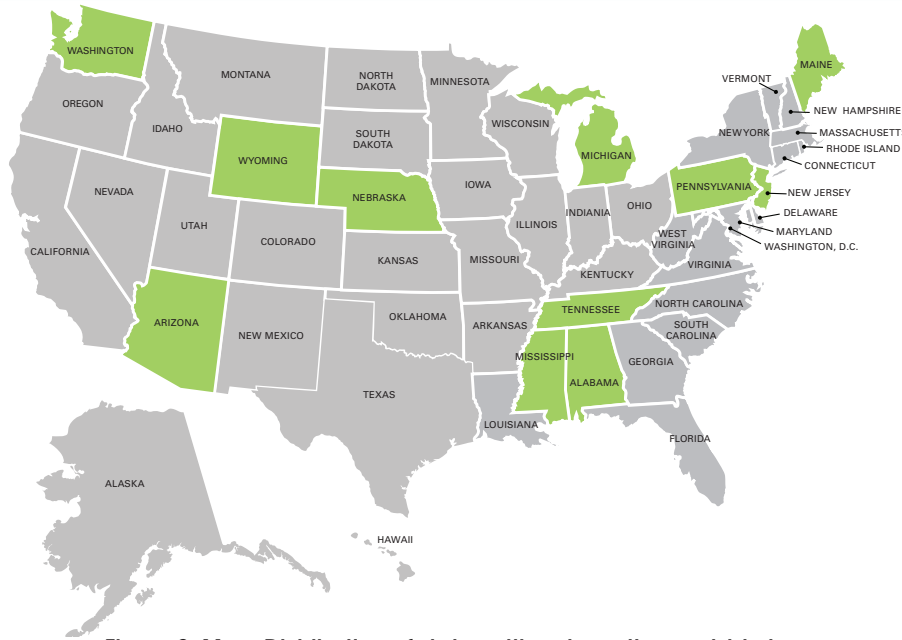


Figure 3. Map. Distribution of states with noteworthy roadside tree and utility pole management practices.

Twenty-eight States and the District of Columbia responded to the survey. As a first pass, researchers selected the 15 States that responded to the tree and utility pole questions. They prioritized the States on this shortlist by applying a basic points system to the survey answers.

Although the survey results were useful to help identify States addressing these

issues, the survey itself was somewhat limiting. Although most questions had an “other” option and offered the opportunity to explain, few States provided additional information. For the most part, respondents seemed constrained by the multiple choice format. However, even with the limitations of the survey, it was reasonable to assume that the States most responsive with tree and utility pole countermeasures would be the most likely to yield best practices.

To identify States with notable tree and utility pole management practices in addition to those participating in the survey, researchers conducted a limited literature review. This effort added an additional State to the draft list based upon a tree management program not disclosed within the survey.

Investigators were concerned, however, about the possibility of a best practice lying within a State that did not respond to the survey. For instance, neither a single State in New England nor a State in the Northern Mountain region answered a tree or utility pole question in the survey. Since these two regions are among the most densely forested in the country, it seemed likely that some best practice countermeasures would be present there. Through previous professional experience with, and additional literature search for this region, the team discovered the potential for additional best practices from a public-private partnership (P3) and an additional State.

Researchers conducted telephone interviews with officials in most of the states chosen from the survey, to learn about their tree and utility pole management practices in greater depth. One State submitted a written response to investigators and the team researched a few other resources independently.

1.3 Organization

There is a hierarchy of roadside safety countermeasures presented by the American Association of State Highway and Transportation Officials (AASHTO) "Roadside Design Guide" and generally accepted across the industry.⁷

1. Remove the obstacle.
2. Redesign the obstacle so it can be safely traversed.
3. Relocate the obstacle to a point where it is less likely to be struck.
4. Reduce impact severity by using an appropriate breakaway device.
5. Shield the obstacle with a longitudinal traffic barrier designed for redirection or use a crash cushion.
6. Delineate the obstacle if the previous alternatives are not appropriate.

For the purpose of this report, however, there are some significant differences that must be noted:

- Neither trees nor utility poles are thought to be traversable in any form.
- Mature trees cannot reasonably be relocated.

Therefore, the AASHTO hierarchy will be distilled down to the following categories of countermeasures, in line with the FHWA Roadway Departure Strategic Plan.⁸

- **Keep the vehicle on the roadway.** A driver who is able to maintain a vehicle's position in the travel lane greatly reduces the probability of a crash occurring. As such, the first priority of roadway departure safety is to keep the vehicle on the roadway. The countermeasures generally deployed to accomplish this include high friction surface treatments (HFST), enhanced signing, rumble strips, and object delineation.
- **Allow the vehicle to recover and regain the roadway.** If a vehicle is unable to maintain its travel lane and departs the roadway, the second priority is to allow it a safe opportunity to return. Agencies generally accomplish this by providing a forgiving roadside that is free of fixed objects and has shoulders and recoverable slopes. The Safety EdgeSM—a compacted beveled pavement edge treatment—can also assist drivers of errant vehicles in regaining the pavement without overcorrecting.⁹
- **Reduce the severity of the crash.** If a vehicle can neither remain on nor regain the roadway, the focus of roadside safety shifts to reducing the severity of any crashes that may occur. Energy-absorbing and breakaway devices make up the primary countermeasures that agencies use to reduce crash severity.

Additionally, there are proactive and reactive measures that practitioners can implement to prevent or reduce tree and utility pole-crashes. Practices aligning with the three countermeasure categories above are presented as reactive in Chapter 2, as they are implemented or applied only after agencies have experienced crashes. Chapter 4 captures proactive practices that influence designs and mitigate safety concerns before they arise.

7 American Association of State Highway and Transportation Officials (AASHTO), *Roadside Design Guide, 4th Edition*, Washington, DC: AASHTO, 2011, pp.1-4.

8 Federal Highway Administration, *FHWA Roadway Departure (RwD) Strategic Plan*, (Washington, DC: March 2013), p.2.

9 FHWA, Center for Accelerating Innovation-Every Day Counts, "Safety EdgeSM," last modified: October 21, 2015. Available at: <http://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/safetyedge.cfm>.

2. REACTIVE MANAGEMENT

In many instances, roadway safety may not have been expressly considered as trees and utility poles were located in close proximity to high-speed rural and suburban highways. Other trees and poles near the roadway may have been grandfathered in as early trails were paved and only enough right-of-way to encompass the steepest slope limits was acquired. Other routes—even those built with appropriate clear zones—have become overgrown with trees and undergrowth due to either unintentional or deliberate decreases in maintenance activities.

Since most practitioners operate systems that are decades old, they can only manage the trees and poles as they currently exist. Most States have policies and standards that prohibit utility poles and trees of significant diameter from being placed near highways during future construction, but reactive management is the only way to deal with those already in place.

This chapter will focus on established roadways, illustrating practices appropriate for keeping vehicles on the roadway, allowing vehicles to regain the roadway, and reducing crash severity.

2.1 Keep the Vehicle on the Roadway

The highest priority, and possibly the easiest strategy to address, is keeping vehicles from departing the roadway, as exemplified by the following four practices.

2.1.1 Alabama: Applying Specific Countermeasures Corresponding to Individual Crash Types¹⁰

Alabama's roadside tree and utility pole management program is a direct product of FHWA's Roadway Departure Focus States Initiative. This program identifies a State's most critical crash types and identifies countermeasures that can be deployed to decrease fatalities and serious injuries. In response to FHWA's analysis, the Alabama Department of Transportation (ALDOT) developed a program and funding stream to address over 400 areas in which roadside fixed object crashes were overrepresented.

ALDOT established an open-ended program to focus on both curve and tree/pole problem areas. They retained two design consultants to more closely analyze each problem area and tailor a specific solution to alleviate the concern. This practical approach uses the data and context for each particular area to devise a solution rather than deploying a single treatment (e.g., clearing) statewide.

While removal of trees is not ruled out—particularly those very close to the traveled way—the solutions are expected to focus on keeping drivers on the roadway, effectively preventing the trees and utility poles from being reached. This could be accomplished by installing HFST, enhanced signing or edge line rumble strips. Widening and/or paving shoulders may also be considered.

¹⁰ Telephone Interview conducted with T. Barnett of the Alabama Department of Transportation, Office of Safety Operations, September 25, 2015.

The ALDOT program has the potential to realize all the benefits of a narrowly focused safety solution while still achieving the widespread advantage of a systemic deployment. Since tree removal is not expected to be the primary solution identified, ALDOT anticipates very little public opposition. If any promotional marketing does need to take place, however, the DOT plans to highlight the expected annual reduction of 40-50 fatal crashes.

While the activity described above is ongoing, ALDOT intends to accomplish most of its efforts within 5 years, as funding allows.

2.1.2 Washington: Targeting Locations through Network Analysis¹¹

Over half of the total land area of Washington State is forested. This vast natural resource has allowed the State to become the Nation's second largest timber producer, supporting over 100,000 jobs in that industry.¹² It also means that the Washington State Department of Transportation (WSDOT) owns hundreds of miles of tree-lined roads. For that reason, the DOT has had an active policy of careful roadside tree management for decades. Currently, a sophisticated strategy is in place as part of the State's Strategic Highway Safety Plan (SHSP), but long before that, trees were dealt with as actual crashes revealed the need.

Eventually, the State's paving program began to drive tree management efforts; roadside trees were considered for removal when they fell within the limits of a programmed resurfacing, restoration, and rehabilitation (3R) project. Though this was a step in the right direction, by the early 1990s the State realized an additional opportunity to manage hazards more efficiently and moved toward the program that is in place today.

WSDOT conducts a biannual comprehensive network analysis that identifies broader areas of potential safety enhancements, not only tree and utility pole issues. The current plan employs a systemic-targeted approach in which countermeasures are coupled with specific crash types, and deployed globally as needed. Since this approach focuses on system performance, crash types, and contributing factors; WSDOT is able to tailor appropriate solutions to individual locations.

In the case of trees and utility poles, the countermeasures deployed are generally designed to keep vehicles on the roadway: rumble strips, enhanced pavement marking, edge delineation, and HFST. As such, trees are seldom removed, and although WSDOT has a contract mechanism by which timber can be harvested on right-of-way, it is rarely used.

Occasionally, the agency shields the obstacles. When shielding is needed, the State takes a two-pronged approach:

- Older installations (50s, 60s and 70s) that may already be shielding obstacles are inspected to verify their performance. The agency upgrades these installations as necessary.
- Shielding is installed—as warranted—if none is currently in place. In some locations, the only significant work in recent history may have been 3R, the scope of which generally excludes additional guardrail.

¹¹ Telephone Interview conducted with J. Ring, A. Nizam, and J. Milton of the Washington State Department of Transportation, September 23, 2015.

¹² Washington Forest Protection Association, "Sustainable Forestry." Available at: <http://www.wfpa.org/sustainable-forestry/>.

WSDOT has experienced surprisingly little public opposition to their roadside tree and utility pole management strategy. This may be due to their performance-focused approach: working together with the public to achieve solutions instead of simply informing them of the plan. While satisfying the concerns of all transportation stakeholders rarely occurs, the agency has had success with achieving public consent with their analytical, data-driven approach.

2.1.3 Pennsylvania: Increasing Safety in Culturally Sensitive Areas¹³

The legislature in the State of Pennsylvania has, for over a decade, appropriated \$10 million annually to fund the transportation-related “Low-Cost Safety Improvement Program.” The program’s funding is distributed among the Pennsylvania Department of Transportation’s (PennDOT) 11 districts. Each district further allocates the money to State routes within their portion of Pennsylvania’s 67 counties, which allows funding to be closely tied to the individual needs of each county in the State.



Figure 4. Photo. Sycamore Allée near Halifax, PA.

The scopes of projects within these counties vary greatly. Low-cost, systemic type projects such as HFST and rumble strip installations are most frequently undertaken, but more complex projects such as road widening or limited new construction are occasionally built. While this program is not limited to tree and pole mitigation efforts, that work is often accomplished as well.

While roadside tree removals are often part of the State’s efforts, one notable case caused officials to consider other countermeasures. Pennsylvania Route 147 in Dauphin County is nicknamed “Sycamore Allée,” for the nearly century-old mature sycamores that line its sides. Listed on the National Register of Historic Places, the tree plantings along this roadway segment north and south of Halifax have uncertain origins, though they are largely believed to have been a memorial to World War I soldiers from the county who were killed in action.¹⁴

When the mature trees along Route 147 were identified as an opportunity for safety improvement, PennDOT officials immediately knew that tree removal was not an option. Instead of introducing the increased crashes inherent in excessive shielding, the DOT decided to focus on keeping vehicles on the roadway. The Department accomplished this by designing HFSTs and superelevation corrections. The initial projects containing these countermeasures are presently under construction, so no performance data is available. Like many other transportation agencies, however, PennDOT has realized a pronounced decrease in roadway departure crashes—at other locations—resulting from HFST.

¹³ Telephone Interview conducted with J. Herschock of the Pennsylvania Department of Transportation Office of Safety Engineering and Risk Management, September 23, 2015.

¹⁴ Pennsylvania Historic Preservation Office, “National Transportation Week: A Road to the Past,” last modified: May 15, 2013. Available at: <http://pahistoricpreservation.com/a-road-to-the-past/>.

2.1.4 Tennessee: Managing Roadside with Environmental Constraints¹⁵



Figure 5. Photo. Yellow prismatic obstacle delineation around a roadside pole in Tennessee.

The Tennessee Department of Transportation (TDOT) generally avoids removing either trees or utility poles from their rights-of-way or from adjoining properties primarily due to two factors: environmental concerns or public resistance. In Tennessee, removing trees or shrubs larger than 6 inches in diameter triggers additional environmental studies and impact statements. This is complicated by the state's being home to at least three species of endangered bats and having an environmental requirement that root wads of cut trees be left in the ground for soil stabilization. In many cases, a new tree can re-grow from the root stock. Additionally, landowners in the state are very resistant to having trees on or along their property removed, regardless of risk to motorists.

Being cognizant of the risks that roadside trees and utility poles present, TDOT searched for a solution that could be deployed quickly and without generating undue environmental or public relations concerns. The answer was tree and pole delineation.

The delineation consists of either a curved retro-reflectorized plate affixed to the tree or pole, or a standard ground-mounted flexible delineator installed near the obstacle. TDOT began using this countermeasure with regularity in 2012. Given the low level of complication and intrusion associated with this product, the agency has not encountered any opposition on the part of transportation stakeholders or utility companies. TDOT will only delineate utility poles that are within the clear zone, and furthermore, only those on the foreslope. This is specifically done to avoid drivers mistaking the delineation for channelization. Even with this policy in place, they field check each potential application site (in person) to determine the possibility of drivers being drawn off the road. If the team believes that possibility exists, the treatment is not used.

A few agencies nationwide have used this countermeasure but no research at this time provides definitive results. As such, no rating is included in the CMF Clearinghouse.

2.2 Allow the Vehicle to Regain the Roadway

If drivers are unable to maintain their lane and vehicles leave the roadway, the next safety priority becomes allowing them a reasonable opportunity to regain the traveled way. This generally involves providing a forgiving roadside as illustrated by the following four practices.

¹⁵ Telephone Interview conducted with B. Hurst and B. Darks of the Tennessee Department of Transportation Program Development and Administration Division, September 23, 2015.

2.2.1 Nebraska: Re-establishing Clear Zones during Resurfacing, Restoration, and Rehabilitation (3R) as well as Resurfacing, Restoration, Rehabilitation and Reconstruction (4R)¹⁶

Nebraska Department of Roads (NDOR) policy stipulates that fixed objects within the right-of-way are to be removed for any project classified as 3R and higher using the minimum clearance widths shown below. The distance cleared is variable based upon roadway functional classification and average daily traffic (ADT).

Table 1. NDOR Fixed Object Clearance Widths

Functional Classification	Average Daily Traffic	Lateral Obstacle Clearance (ft)
Interstate	All	35
Expressway	All	30
Major Arterial	≥ 4,000	30
Minor Arterial	2,000 - 3,999	30
Major Arterial	400 - 1,999	23
Minor Arterial	< 400	16

This practice has been in place since the 1980s, but has become especially important in recent years when Nebraska, like so many other States, changed its mowing policy. The department used to mow the entire right-of-way—from fence line to fence line—but now only mows a single pass adjacent to the roadway. This allows more substantial vegetation like trees and shrubs to take root and flourish. When adhering to NDOR’s policy, obstacles of this nature are removed or otherwise controlled on the normal paving schedule: about every 10 years.

Since this policy is codified into State law, it is able to transcend any public opposition that may arise and, to date, the public has not voiced any opposition to NDOR concerning this practice.

It is important to remember that NDOR’s policy goes beyond trees alone and applies to all fixed objects. Utility pole concerns within the above-specified clear recovery areas are handled on a case-by-case basis. A Roadside Safety Analysis Program assessment is usually completed and if a concern is detected, the department works with the utility company for relocation, or shields the pole.

2.2.2 Michigan: Clearing through Informed Consent¹⁷

The Michigan Department of Transportation (MDOT) practices roadside tree removal, but any safety benefit realized is strictly ancillary. The clearing effort is primarily a maintenance function performed for drainage improvements.

There have been a handful of safety-focused tree removal projects, but they were few in number and implemented exclusively in reaction to crashes. These projects are generally the result of MDOT’s Local Safety Initiative, a program staffed by three engineers statewide for the sole purpose

¹⁶ Telephone interview conducted with P. Tenhulzen, Nebraska Department of Roads Roadway Design Division, September 22, 2015.

¹⁷ Telephone interview conducted with T. Leix, Michigan Department of Transportation Local Agency Program Section, September 24, 2015.

of developing safety solutions for local roads. Even with the State's leadership, however, most local jurisdictions follow the DOT's lead with respect to clearing for safety in a reactive manner only.

Lapeer County is the lone exception, having established a proactive tree-clearing program exclusively for enhancing roadside safety. The County has managed the public's concerns about tree removals by conducting substantial outreach and meeting with adjacent property owners well in advance of clearing. The agency's tree removal/trimming policy is publicly available on the County's website and clearly outlines their responsibility and authority to maintain the safety of public roads.¹⁸

As an added benefit, the County makes the harvested wood available to adjacent landowners to supplement their home heating supply. MDOT believes this sort of outreach may serve as a model for them to ease the public opposition often associated with clearing operations, and plans to rely upon the positive rapport already established through their 22 Transportation Service Centers to do so. These local offices respond to the transportation needs of surrounding communities, and are strategically located throughout the state such that no resident lives more than an hour distant from one.¹⁹

2.2.3 Mississippi and Arizona: Establishing and Maintaining Clear Zones

*Mississippi*²⁰

Mississippi's tree management policy does not involve clear-cutting the right-of-way from fence line to fence line. Rather, the DOT clears the appropriate clear-zone width per the AASHTO Roadside Design Guide irrespective of right-of-way limits. For new construction projects, the contractor's documents limit pay for clearing and grubbing to the clear-zone width only, leaving mature standing timber between that limit and the right-of-way boundary. Reconstruction projects are only subject to clear zone establishment on a case-by-case basis. This activity usually only takes place when previous crash problems have been identified.

This policy has been part of the Mississippi Department of Transportation (MSDOT) culture for as long as current employees can remember, so it is hardly surprising that public discontent is a non-issue. In fact, the policy only ever becomes problematic when the DOT is perceived as clearing trees that pose no threat to drivers.

Utility poles are generally treated by the same set of rules as trees, but very few poles exist within the clear zone. Rather, they are located at the edges of the rights of way. Poles that are within the clear zone (e.g., signing, signals, and lighting) have breakaway bases and, accordingly, are left undisturbed.

18 Lapeer County Road Commission, *Tree Removal/Trimming Policy*, (Lapeer County, MI: January, 2015). Available at: <http://lcrconline.com/323%20TREE%20REMOVAL%20TRIMMING.pdf>.

19 State of Michigan, GIS Open Data, "MDOT Transportation Service Centers," Available at: http://gis.michigan.opendata.arcgis.com/datasets/efc29ee8220643ffbeac4b396c22ab16_4.

20 Telephone interview conducted with B. Hovanec, M. Thomas, and H. Patterson, Mississippi Department of Transportation Traffic Safety, September 24, 2015.

Arizona²¹

Arizona's roadside tree and utility pole management program is a direct product of the FHWA's Roadway Departure Focus States Initiative. Specifically, the Arizona Department of Transportation (AZDOT) is piloting a project to remove trees from the clear zones of two State highways.

The original plan was to establish the clear zones and significantly thin the remaining trees back to the right-of-way limits. But due to the complex natural environment in Arizona, the DOT faced a myriad of challenges from the general public, Native American Tribes, the United States Forest Service, threatened and endangered species laws, and other regulations. For these reasons, the scope of the effort was scaled back to removing trees within the clear zones limits, and only thinning where a site-specific reason dictated.

2.3 Reduce the Severity of Crashes

If drivers are unable to regain the roadway, the third safety priority is to reduce the severity of any crashes that may occur. This practice is generally accomplished through roadside hardware that absorbs the crash energy or channels it away from the driver.



Figure 6. Photo. Composite utility pole undergoing strength testing.²³

2.3.1 New Jersey: Using Poles That Absorb Crash Energy

Utility pole crash fatalities are disproportionate in New Jersey, a State that ranks 22nd in all traffic fatalities, but 8th in those involving utility poles.²² Approximately 260 sites have been identified statewide as having multiple utility pole crashes over a 3-year period.

With this in mind, New Jersey Department of Transportation (NJDOT), in conjunction with researchers at Rowan University, developed the Pole Mitigation Program to identify and improve highest-risk utility pole crash locations. Twenty sites that are not part of any active design or construction effort have been selected for mitigation.

Within the PMP there is an effort to pilot the use of energy-absorbing poles at some locations. These poles differ in many ways from their wood and steel breakaway counterparts. The hollow poles feature composite construction consisting of filament-wound fiberglass-reinforced polyester. They are 45 feet long with a wide octagonal cross-section on the lower portion that transitions to a narrow circular cross-section near the top.²⁴ The poles are designed to collapse upon impact as opposed to breaking away and potentially falling into traffic. Analysts observed no excessive occupant risks factors in either of two separate crash tests.²⁵

21 E-mail exchange conducted with J. Marino, Arizona Department of Transportation Project manager, September 21-25, 2015.

22 H. C. Gabler, D. Gabauer, and W. Riddell, *Breakaway Utility Poles: Feasibility of Energy Absorbing Pole Installations in New Jersey*, (Trenton, NJ: New Jersey Department of Transportation, 2007), p.8.

23 Foedinger, R., et al, "Development of an Energy Absorbing Pole," (paper presented at the 82nd Annual TRB Meeting, Washington DC, January 2003).

24 Ibid., p. 28.

25 Ibid., p. 29.

As shown below, these poles offer several advantages over traditional wooden poles.²⁶

Table 2. Comparison of composite pole to wooden pole.

Characteristic	Composite Pole	Wooden Pole
Weight	475 lbs.	1,000 lbs.
Service Life	80 yr. (consistent performance)	20-50 yr. (declining performance)
Maintenance	None	5-7 years

While NJDOT initially experienced hesitation from the utility companies when they were invited to participate in the PMP, continued outreach eventually produced an agreement for replacing and installing fiberglass poles when possible in accordance with the policy.

2.4 Roadside Tree Management Practices for Reasons Other than Safety

The preceding sections of this report have described States' efforts to manage roadside trees and utility poles for the specific purpose of increasing safety. There are, however, tree-management practices whose goals lie outside the scope of roadway departure safety. Nevertheless, increased roadside safety is the inevitable byproduct of the thinning or outright clearing of roadside tree, for any reason. Simply put, fewer trees mean less opportunity for fatal and severe injury tree crashes. The following sections describe such efforts in two States and a public-private partnership.

“Simply put, fewer trees mean less opportunity for fatal and severe injury tree crashes.”

2.4.1 Alabama: Preventing Weather-related Tree Hazards

An unusually severe ice storm caused \$3 billion of damage across the southeast region of the United States in the winter of 1994. In northwest Alabama alone, there was approximately \$500 million in damages to homes, businesses, communication infrastructure, and electric utilities. Alabama had so many trees and limbs blocking the roads that travel was virtually impossible.²⁷ A number of fatalities occurred as a result of weather-related crashes throughout the region, and in Alabama, one driver was killed by a falling tree.²⁸

As a result of the storm, Alabama officials decided that clearing roadside trees would be a reasonable deterrent to future dangers posed by storms of this type. Ice events are normally confined to northern Alabama, but the southern part of the state experiences tree-related traffic dangers posed by hurricanes. For these reasons, the ALDOT Interstate Right-of-Way Clearing

²⁶ Foedinger, R., et al, "Development of an Energy Absorbing Pole," (paper presented at the 82nd Annual TRB Meeting, Washington DC, January 2003), p. 28.

²⁷ National Oceanic and Atmospheric Administration (NOAA), *The February 1994 Ice Storm in the Southeastern U.S.*, (Asheville, NC), Available at <http://www.ncdc.noaa.gov/oa/pub/data/special/iwais96.pdf>.

²⁸ Richard Perez-Pena, "Surprise Storm Turns Much of South into Sheet of Ice," *The New York Times*, February 11, 1994, accessed January 22, 2016. <http://www.nytimes.com/1994/02/11/nyregion/surprise-storm-turns-much-of-south-into-sheet-of-ice.html>.

Program was deployed across the entire State.

A typical clearing contract within the program consisted of clear-cutting 50 feet on either side of the traveled way—toward the median and toward the right-of-way boundary—in both directions. The specifications also required selective thinning beyond 50 feet. Projects were approximately 5-miles in length and encompassed about 250 acres each. ALDOT solicited contract bids from timber companies to log the parcels, which were harvested for use as both dimensional lumber and pulp.²⁹

While ALDOT's Interstate Rights-of-Way Clearing Program has generally been considered a success, there were difficulties in its execution; chiefly, the unconventional nature of logging in a linear fashion close to live traffic, as opposed to working an isolated, local parcel. The logging contractors experienced both difficulty moving log trucks on and off of the roadway as well as increased complication in loading the trucks from a moving operation instead of a static



Source: Maine Turnpike Authority

Figure 7. Photo. Before and after tree clearing along the Maine Turnpike.

landing.³⁰ The high visibility of the inherently unsightly work led to complaints from travelers, environmental groups, and the general public. ALDOT officials dealt with this opposition by emphasizing the safety focus of the work. They reassured stakeholders that the worksites would look noticeably better when leaves returned to the remaining trees, and State forces cleared the contractors' debris, redressed the slopes, and reestablished grass.³¹

During the years since the program began, ALDOT's intent has been to shift its focus from clear-cutting to maintaining the previously-accomplished clearing using herbicides. Workers focus primarily on controlling the hardwood species that survive mowing operations, and pruning mature trees whose branches pose a falling hazard.

2.4.2 Maine Turnpike Authority: Increasing Natural Snow-melt³²

In 2012, the Maine Turnpike Authority (MTA) began a 5-year program of clearing trees along

109 miles of its Interstate 95 corridor. The agency established the program as a way to reduce the

29 "900 Legal Notices: Notice to Bidders Timber for Sale," *The GadsdenTimes*, September 12, 1996, accessed January 22, 2016. <https://news.google.com/newspapers?nid=1891&dat=19960912&id=hQBHAAAIBAJ&sjid=Bv4MAAAIBAJ&pg=2493,1087990&hl=en>.

30 Telephone Interview conducted with T. Barnett of the Alabama Department of Transportation Office of Safety Operations, January 21, 2016.

31 Associated Press. "Median Tree Cutting Turns into Eyesore, Sets off Criticism," *The Gadsden Times*, December 31, 1996, accessed January 22, 2016. <https://news.google.com/newspapers?nid=1891&dat=19961230&id=SMQfAAAIBAJ&sjid=O9gEAAAIBAJ&pg=59823668742&hl=en>.

32 Telephone interview conducted with S. Tarte of the Maine Turnpike Authority-Engineering and Building Maintenance, January 21, 2016.

salt used for snow and ice control by removing trees that shaded the pavement. The solar gain realized from clearing efforts resulted in pavement temperatures up to 10 °F higher than those with trees in close proximity. Warmer pavements inhibit the bonding of snow and ice, resulting in easier snow removal and less salt usage in winter weather events.

MTA also realizes other equally important benefits from its clearing program:

- Wider clear zones
- Increased driver reaction time during animal encounters
- Increased sight distances
- Decreased potential for tree fall on the roadway in ice events

MTA crews cleared approximately 10 miles per year, removing all live trees and bushes, brush, downed timber, and debris within 100 feet of the center line of the traveled way in both directions. They ground stumps down until they were flush with ground level within the limits of the clear zone as well as within 15 feet vertically of the ditch line and within 3 inches of the grade in the remaining locations. Clearing contractors harvested the timber for use both as dimensional lumber and pulp.

MTA did not experience any appreciable opposition on the part of environmental agencies or the general public; this is likely due to their proactive efforts. The very impetus of the program—decreased salt use—was an attempt to preserve Maine’s excellent groundwater quality. Additionally, the Authority exhibited responsible stewardship by leaving 25-foot tree buffers lining the banks of the streams that intersect the corridor.

Adjoining property owners had little opposition to the Authority’s activities within the right-of-way, but some parcels were more profoundly affected than others. Officials reached out to these owners with a letter and a brochure explaining the purpose and scope of the clearing effort. If clearing operations were to have completely exposed an otherwise shielded home, the Authority left a buffer of trees in place to preserve the visual screen between the structure and the highway. When leaving such a buffer was infeasible, they replanted trees of a smaller species. For instance, a 70-foot species may be replaced with trees whose mature height was only 20-feet. In this manner, the shadows on the roadway were still minimized.

Upon completion of clearing operations within a segment, the MTA’s focus shifts to maintaining the cleared area. This is accomplished by routine mowing and minor clearing using lighter equipment than that used in the initial operation.

2.4.3 Wyoming: Removing Dead or Diseased Trees To Mitigate Fall Hazards³³

An extended drought around the turn of the 21st century caused an ongoing epidemic of Mountain Pine beetle infestations in Wyoming.³⁴ These beetles kill trees by boring into and laying their eggs under the bark, introducing a fungus that hastens the tree's death.³⁵ The dead trees pose a significant threat to public safety by way of fueling wildfires and creating falling hazards. Beetle epidemics cannot be stopped by artificial means and only climatic changes—namely sustained colder winters—can bring them to an end.

High winds accelerate the downing of beetle-killed trees in Wyoming but in fact, every tree will fall within a decade of being killed, irrespective of the weather. Both the Wyoming Department of Transportation (WyDOT) and the United States Department of Agriculture (USDA) Forest Service realized the potential hazard associated with beetle-killed trees and limbs falling onto roadways, vehicles, or fences. The danger associated with the latter is the possibility of livestock wandering onto the roadway. To proactively decrease the risks associated with deadfall, the agencies developed a program of selective tree thinning along roadsides.

Under the program, the DOT marks infested trees—dead or alive—then lets a contract for their removal. Contractors are free to dispose of the trees as they choose; most sell the larger trees for dimensional lumber, and the smaller for pulp or firewood.

The program has been successful and, in a state that is among the hardest hit by the beetle infestation, there has been little opposition on the part of stakeholders. WyDOT has performed clearing contracts in various locations throughout the state.

33 Telephone interview conducted with C. Muller of the Wyoming Department of Transportation-District 1 Maintenance Division, January 21, 2016.

34 USDA Forest Service, Medicine Bow-Routt National Forests & Thunder Basin National Grassland, "Mountain Pine Beetle Epidemic." Available at: <http://www.fs.usda.gov/detail/mbr/home/?cid=stelprdb5139168>.

35 Colorado State University Extension Service, *Mountain Pine Beetle, Fact Sheet* No. 5.528 (Fort Collins, CO: February 1999), p.2.

3. PROACTIVE MANAGEMENT

Tree and utility management practices are generally reserved for rural areas and are largely reactive, in that, the safety practitioner has to manage a preexisting concern. Since no known States are intentionally introducing trees that mature to significant diameters into the clear zones of high speed rural routes, few—if any—standards governing the practice exist.³⁶

The lower speed urban setting is much different. Trees, hardscape, and utility poles are routinely placed in relatively close proximity to vehicles. There are a number of reasons for this:

- **Aesthetics** – A city’s identity is closely associated with the aesthetic presented. To many travelers, it’s the first indication of the community’s character that they will encounter.³⁷
- **Health** – Studies suggest that urban vegetation may be associated with increased levels of physical activity³⁸ and decreased levels of depression.³⁹
- **Environment** – Trees improve air quality through temperature reduction, air pollution removal, reduced ultraviolet radiation, and carbon storage.⁴⁰ They improve water quality by detaining and filtering surface run-off, and releasing it back into the atmosphere. Trees beyond the roadside clear zone are also vital to the health of pollinators such as bees, birds, bats.⁴¹

Urban landscaping and forestry are an increasingly noticeable element of urban design, and the benefits they are believed to provide maintain that prominence. Therefore, the design process must balance their benefits with the necessity for roadside safety.⁴²

36 California Department of Transportation, *Trees and Highway Safety*, (Sacramento, CA: March 18, 2010), pp.13-21.

37 Federal Highway Administration, *Urban Tree and Landscape Safety*, Task T-06-005(McLean, VA: February 2, 2009), p. 85.

38 Ruth Hunter, et al., “The impact of interventions to promote physical activity in urban green space: A systematic review and recommendations for future research,” *Social Science and Medicine*, Volume 124, (January 2015): 246-256.

39 Hannah Cohen-Cline, Eric Turkheimer, and Glen Duncan, “Access to green space, physical activity and mental health: a twin study,” *Journal of Epidemiology & Community Health*, Volume 69, Issue 6, (June 2015): 523-529.

40 D.J. Nowak and G.M. Heisler, *Air Quality Effects of urban Trees and Parks*, (Ashburn, VA: National Recreation and Park Association, 2010), p.3.

41 FHWA, *Pollinators and Roadsides: Best Management Practices for Managers and Decision Makers*, FHWA-HEP-16-020 (Washington, DC: December 2015). Available at: https://www.environment.fhwa.dot.gov/ecosystems/vegmgmt_pollinators.asp.

42 American Association of State Highway and Transportation Officials, *Roadside Design Guide, 4th Edition*, Washington DC: AASHTO, 2011, p.10-15.

4. URBAN TREE AND UTILITY POLE RECOMMENDED PRACTICES

Urban practitioners have the opportunity to influence the design of highway and street projects, and mitigate safety concerns before they arise.⁴³ The following section describes a number of practices for enhancing safety while introducing trees and utility poles into the urban roadside environment.

4.1 Lateral Offset

Utility poles and trees of mature diameters greater than 4 inches are recommended to be located at least 6 feet behind the curb of urban roadways. Lateral offset always need to be greater than 4 feet behind the curb. See also the *AASHTO Roadside Design Guide* for additional guidance.

“...the design process must balance [landscaping] benefits with the necessity for roadside safety.”

4.2 Visibility

It is recommended that trees and utility poles be located so as not to restrict the drivers' sight. Some suggestions for improving sight distance and visibility include:

- Keeping intersection sight triangles clear of any visual obstructions between 3 feet and 10 feet vertically.
- Placing trees and poles outside of established sight distance parameters for horizontal curves on ramps.
- Locating trees and poles where their presence will not obstruct regulatory, warning, or advisory signing.

4.3 Weather

It is also advisable to place trees where their shadows will not interfere with the solar impact of snow and ice melting.

⁴³ Federal Highway Administration, *Urban Tree and Landscape Safety*, Task T-06-005 (McLean, VA: February 2, 2009), p.96.

4.4 Maintenance

As plantings are considered, it is optimal to avoid tree species with the following characteristics:

- Their fruit, seed pods, brittle branches, or leaves would obstruct drainage facilities resulting in gutter spread into the travel lanes.
- Their fruit is edible and could attract humans or wildlife into the roadway, creating a safety hazard.

4.5 Worker Safety

Trees and shrubs need to be planted in locations where their maintenance will not place workers in close proximity to live traffic.

5. CONCLUSION

The majority of fatal crashes in the United States involve roadway departures; nearly half of these crashes involve a fixed object, two-thirds of which are roadside trees and utility poles. Such an overrepresentation suggests that properly managing trees and utility poles will reduce fatal crashes.

While this management has proven to be elusive on a national scale, there are a number of noteworthy management practices being accomplished by individual State, County and a public-private partnership throughout the United States.

These practices represent a variety of purposes and scopes for managing trees and utility poles that are already in place and may assist practitioners in handling similar situations within their jurisdictions. There are far more opportunities to manage the safety of these roadside elements if practitioners are able to influence the design before landscaping or utilities are installed.

Until more comprehensive research is performed in this area, the proven practices described within this report can be deployed on a smaller scale and tailored to fit individual agency needs.

6. RECOMMENDED READING

As stated previously, this report is a snapshot of some best management practices—currently under real-world deployment—within agencies around the nation; it is not intended to be a comprehensive guide to managing roadside trees and poles. There have been a number of other works written about tree and pole management strategies and additional research is being proposed within the industry. In addition to the *AASHTO Roadside Design Guide*, the two works described and cited below are recommended reading for additional information.

They are drawn from the NCHRP 500 series, a compendium of guidance to aid in reducing fatal and serious injury crashes within certain focus areas.

6.1 Trees

Report 500-Volume 3, focuses on lowering the incidence and severity of tree crashes, primarily by preventing trees from growing in hazardous locations in the first place, and eliminating existing trees or reducing the severity of crashes in which they are involved.⁴⁴

6.2 Utility Pole

Report 500-Volume 8, focuses on lowering the incidence and severity of utility pole crashes, by preventing the placement of, and treating poles in high risk locations. It also examines treating several poles—corridor-wide—to decrease the likelihood impacting a pole in a run off road event.⁴⁵

⁴⁴ Neuman, T., et al, NCHRP *Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, Volume 3: A Guide for Addressing Collisions with Trees in Hazardous Locations*, Washington DC: Transportation Research Board of the National Academies, 2003.

⁴⁵ Neuman, T., et al, NCHRP *Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, Volume 8: A Guide for Reducing Collisions Involving Utility Poles*, Washington DC: Transportation Research Board of the National Academies, 2004.

For More Information:

Noteworthy Practices for Roadside Tree and
Utility Pole Management, visit: <http://safety.fhwa.dot.gov/>



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